WHAT IS CLAIMED IS:

1. A CVD diamond-coated composite comprising:

(a) a substrate having a surface, and comprising:

(1) a first phase comprising at least one ceramic material ; and

(2) a second phase comprising at least one carbide-forming material ; and

(b) a chemical vapor deposited diamond coating disposed on at least a portion of a surface of the substrate.

2. A composite of claim 1, wherein at least one of the second phase materials is dispersed in a matrix formed by the first phase material.

3. The composite of claim 1, wherein at least one of the first phase materials is dispersed in a matrix formed by the second phase material.

4. The composite of claim 1, wherein the region of carbide-forming material comprises a coating on one or more pores formed in the region of ceramic material.

5. The composite of claim 3, wherein the first phase comprises one or more grains of the ceramic material dispersed within a matrix of the second phase, comprising the carbide-forming material.

6. The composite material of claim 1, wherein the ceramic material comprises silicon carbide, silicon nitride, silicon aluminum oxynitride, aluminum nitride, tungsten carbide, tantalum carbide, titanium carbide, boron nitride, or mixtures thereof.

7. The silicon carbide composite of claim 6, wherein the region of silicon carbide comprises fully sintered alpha silicon carbide.

8. The silicon carbide composite of claim 6, wherein the carbide-forming material comprises silicon, titanium molybdenum, tantalum, niobium, vanadium, hafnium, chromium, zirconium, and tungsten, or combinations thereof.

9. A CVD diamond-coated composite comprising:

(a) a substrate having a surface, and comprising:

(1) a first phase comprising silicon carbide ; and

(2) a second phase comprising silicon metal; and

(b) a chemical vapor deposited diamond coating disposed on at least a portion of a surface of the substrate.

10. The silicon carbide composite of claim 9, wherein the silicon carbide phase comprises a matrix of silicon carbide, and wherein the silicon metal phase comprises particles or a network of silicon metal dispersed in the silicon carbide matrix.

11. The silicon carbide composite of claim 9, wherein the silicon metal phase comprises a matrix of silicon metal, and the silicon carbide phase comprises one or more grains of silicon carbide disposed in the silicon metal matrix.

12. The silicon carbide composite of claim 9, wherein the first phase comprises fully sintered alpha silicon carbide.

13. The silicon carbide composite of claim 9, wherein the first phase comprises reaction-bonded graphite-silicon carbide composite material.

14. The silicon carbide composite of claim 8, wherein second phase comprises metallic silicon coating the surfaces of one or more pores of the first phase.

15. The silicon carbide composite of claim 8, wherein the second phase comprises grains of metallic silicon dispersed in the first phase.

16. A polishing pad conditioning head, comprising:

the chemical vapor deposited diamond composite of claim 1.

17. The polishing pad conditioning head of claim 16, further comprising:

a first layer of diamond grit having an average grain size in the range of about 1 micron to about 15 microns and substantially uniformly distributed with respect to an exposed surface of the substrate; and

wherein the layer of chemical vapor deposited diamond disposed on the diamond grit-covered substrate, whereby the layer of chemical vapor deposited diamond at least partially encases and bonds the diamond grit to the substrate.

18. The polishing pad conditioning head of claim 16 wherein the average grain size of the diamond grit is in the range of about 4 microns to about 10 microns.

19. The polishing pad conditioning head of claim 17 wherein said grit is substantially uniformly distributed with respect to the surface of said substrate at a density between about 100 to about 50000 grains per mm^2.

20. The polishing pad conditioning head of claim 18 wherein said grit is substantially uniformly distributed on the surface of said substrate at a density of about 400 to about 2000 grains per mm^2.

21. The polishing pad conditioning head of claim 16, further comprising a layer of diamond grit having an average diameter less than 1 micron and that is substantially uniformly distributed with respect to said first layer and with respect to remaining exposed surface of the substrate and beneath said layer of chemical vapor deposited diamond.

22. The polishing pad conditioning head of claim 16, further comprising a backing layer bonded to said conditioning head.

23. The polishing pad conditioning head of claim 16 wherein said diamond grit has been distributed over the exposed surface of said substrate by an air dispersion process, comprising dropping the grit at a controlled rate from a fixed height above said exposed surface into a moving air current thereby dispersing the diamond grit in a lateral direction across said exposed surface while moving said source in a direction substantially orthogonal to the direction of the air current.

24. The polishing pad conditioning head of claim 16, wherein the ceramic material comprises silicon carbide and the carbide-forming material comprises silicon.

25. The polishing pad conditioning head of claim 16, wherein diamond layer is bonded directly to the substrate, without encased or bonded particles of grit.

26. A polishing pad conditioning head, comprising:

(a) a substrate having a surface, and comprising:

(1) a first phase comprising at least one ceramic material; and

(2) a second phase comprising at least one carbide-forming material, and having a first side and a second side;

(b) a layer of diamond grit having an average grain size in the range of about 1 micron to about 150 microns substantially uniformly distributed with respect to said first and second sides; and

(c) a layer of chemical vapor deposited diamond deposited on the grit-covered first and second sides, whereby the layer of chemical vapor deposited diamond encases and bonds said diamond grit to said sides.

27. A method of making a polishing pad conditioning head comprising:

(a) uniformly distributing a first layer of diamond grit having an average particle diameter in the range of about 1 micron to about 15 microns over an exposed surface of a substrate having a surface, and comprising:

(1) a first phase comprising silicon carbide; and

(2) a second phase comprising silicon metal; to achieve an average grit density in the range from about 100 to about 50000 grains per mm^2;

(b) chemical vapor depositing an outer layer of polycrystalline diamond onto the exposed surface of the grit covered substrate; and

(c) recovering a polishing pad conditioning head having a grit covered substrate encased in polycrystalline diamond having a thickness of at least about 20% of the grit size.

28. The method of claim 27, wherein said chemical vapor depositing comprises:

(1) placing the resulting grit covered substrate into a hot filament chemical vapor deposition reactor;

(2) heating said grit covered substrate to a deposition temperature of about 600° C to about 1100° C.; and

(3) passing a gaseous mixture of about 0.1% to about 10% hydrocarbon and the balance hydrogen into said reactor under a pressure of not greater than 100 Torr.

29. A thermal spreader, comprising:

(a) a substrate having a surface, and comprising:

(1) a first phase comprising a ceramic material; and

(2) a second phase comprising a carbide-forming material; and

(b) a chemical vapor deposited diamond coating disposed on at least a portion of a surface of the substrate of thickness between 10 microns and 2000 microns.

30. The thermal spreader of claim 29, wherein the thickness of the diamond coating is in the optimal range from about 100 microns to about 400 microns.

31. The thermal spreader of claim 30, wherein the diamond coating is polished to a surface finish of < 1 micron Ra.

32. The thermal spreader of claim 29, wherein the ceramic material comprises silicon carbide and the carbide-forming material comprises silicon.

33. A cutting tool blank, comprising:

(a) a substrate having a surface, and comprising:

(1) a first phase comprising a ceramic material; and

(2) a second phase comprising a carbide-forming material; and

(b) a chemical vapor deposited diamond coating disposed on at least a portion of a surface of the substrate to a thickness of 10 microns to about 1000 microns.

34. The cutting tool blank of claim 33, wherein the thickness of the diamond coating is in the optimal range from about 50 microns to about 500 microns.

35. The cutting tool blank of claim 33, wherein the diamond coating is polished to a surface finish of < 1 micron Ra.

36. The cutting tool blank of claim 35, wherein the diamond coating is polished to a surface finish of < 0.05 micron Ra.

37. The cutting tool blank of claim 33, wherein the ceramic material comprises silicon carbide and the carbide-forming material comprises silicon.

38. A wear component, comprising:

(a) a substrate having a surface, and comprising:

(1) a first phase comprising a ceramic; and

(2) a second phase comprising a carbide-forming material; and

(b) a chemical vapor deposited diamond coating disposed on at least a portion of a surface of the substrate to a thickness of 0.01 micron to about 2000 microns.

39. The wear component of claim 38, wherein the thickness of the diamond coating ranges from about 0.1 micron to about 50 microns.

40. The wear component of claim 38, wherein the diamond coating is polished to a surface finish of < 1 micron Ra.

41. The wear component of claim 38, wherein the ceramic material comprises silicon carbide and the carbide-forming material comprises silicon.

42. The polishing pad conditioning head of claim 16, further comprising:

a first layer of diamond grit having an average grain size in the range of about 15 microns to about 150 microns and substantially uniformly distributed with respect to an exposed surface of the substrate; and

wherein the layer of chemical vapor deposited diamond disposed on the diamond grit-covered substrate, whereby the layer of chemical vapor deposited diamond at least partially encases and bonds the diamond grit to the substrate.

44. The polishing pad conditioning head of claim 42, wherein the diamond grit has an average grain size of about 75 microns.

45. A composite article comprising:-

a) a substrate comprising a ceramic phase and a phase having a higher adhesion to chemical vapor deposited diamond than the ceramic phase; and

b) a chemical vapor deposited diamond coating disposed on at least a portion of a surface of the substrate.

46. The composite article of claim 45, in which the ceramic phase forms a matrix, with the phase having a higher adhesion to chemical vapor deposited diamond than the ceramic phase dispersed therein.

47. The composite article of claim 45, in which the phase having a higher adhesion to chemical vapor deposited diamond than the ceramic phase forms a matrix, with the ceramic phase dispersed therein.

48. The composite article of claim 45, wherein the phase having a higher adhesion to chemical vapor deposited diamond than the ceramic phase comprises a carbide-forming material.